# Sudbury Neutrino Observatory High Energy Event Analyses

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Although the primary goal of the Sudbury Neutrino Observatory (SNO) is the measurement of neutrinos from the Sun, there will be a sizable number of events from muons and neutrinos produced in the atmosphere. The study of these events is interesting in terms of the background which they may provide as well as the physics that may reveal on their own:

- A muon passing through the detector can produce lower energy events in the detector via spallation or decay, and these events can serve as a background for solar neutrino analyses.
- Evidence of neutrino oscillations have been reported based on the observation of neutrinos produced in the atmosphere. Because of the large overburden for the SNO detector, the analysis can be extended to higher energy by examining events crossing the detector from directions somewhat above and below the horizon.

Solar neutrino events in the SNO detector have Cherenkov light produced over a distance of a few cm. The high energy events may have light produced over distances of a few cm to 19 m. Clearly the techniques used to analyses these two classes of events must be very different. The LBNL SNO group has devised algorithms for identification and reconstruction of the high energy events. A plot of the angular distribution for a sample of the fit high energy events is displayed in Figure 1. We are encouraged by the apparent flattening of the of the distribution for $\cos\theta < 0.4$ indicating a sensitivity to events from atmospheric neutrinos at $\theta > 65°$. Examination of the efficiencies of the high energy event analysis is underway, and some improvements to the algorithms are being considered.

An investigation of the rates of solar neutrino backgrounds from spallation and decay products associated with the high energy events is in progress.

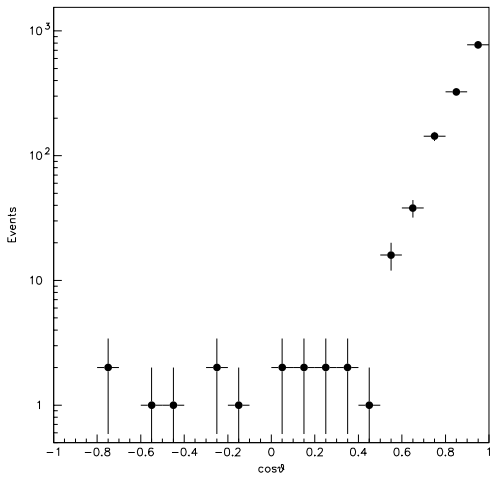


Figure 1: Zenith angle distribution for muons observed in the SNO detector over a 1 month period. Values of $\cos\theta \sim 1$ are coming from above while $\cos\theta \sim -1$ are coming from below the detector.